Incorporating "The Illuminating Engineer."

Light and Lighting

Official Journal of the Illuminating Engineering Society.

32, Victoria St., London, S.W.1.

Edited by J. STEWART DOW

Telephone: ABBey 5215.

Vol. XXXIV.—No. 3 **March, 1941** PRICE NINEPENCE Subscription 10/6 per annum, post free

Principal Contents:

	PAGE
Editorial Notes....	37
Notes and News	38
The Colour Group	40
Photographic Studio Lighting	42
Illuminating Engineering in U.S.A.	46
The Editor Replies	48
Lighting Literature	49
Where to Buy	51

Photometry Comes Into Its Own

PHOTOMETRY, indispensable to the expert as a means of assessing the effects of natural and artificial light, was for long a mystery to the layman. Several things have contributed to bring it within the common ken.

So long as only photometers of the "visual type" were available, and measurement involved matching the brightness of two surfaces, usually inspected through an eyepiece, authorities and public looked askance at the process.

The embodying of a photoelectric cell in an instrument enabling illumination, for the first time, to be recorded by the simple movement of a pointer on a dial brought photometry within the category of familiar things.

The references to foot-candles in successive Departmental Reports and culminating in the recent official Order relating to Factory Lighting have helped. The adoption of a system of War Time Street Lighting essentially based on photometry has likewise served to prove that the "cinderella amongst sciences" is coming into its own—even if it has required the tribulations of the black-out to bring about this condition.

Perhaps the most convincing evidence that photometry is no longer a mystery is afforded by the action of the Police, who, it is stated, have now equipped themselves with some hundreds of specimens of a new and simple form of photometer in order to check compliance by motorists with the requirements of the Lighting Order !

A.R.P. Lighting Problems

Although the essential data in connection with various A.R.P. lighting problems have been presented in B.S.I. specifications, there is room for discussion on the principles involved, which often clarifies the objects in view. The account of work on masks for motor-car headlights, fittings for low illuminations and A.R.P. signs, at the I.E.S. meeting in London on March 11 was therefore timely. Mr. Percy Good gave a brief introductory address on recent developments of work of I.E.S. committees. It was gratifying to hear of the high regard in which the society's work is held. Mr. Stanley, Mr. Maxted, and Mr. Bertram, who dealt with the three problems mentioned above, managed to compress a great deal of information into the time available. Numerous knotty points in connection with motor-car headlights were raised, and there was some discussion on a familiar point of principle—the compromise between glare and uniformity of illumination met in connection with widely-spaced fittings to furnish low illuminations. In addition to the work on illuminated signs, which has been embodied in a useful specification, something was also said on the subject of shelter-marking (by white outlines or dotted patterns)—a field in which much exploration work, so far unpublished, has been done. A pleasant feature was the reference made by the President to the election of Mr. A. P. Trotter as an honorary member of the Society—an announcement greeted with acclamation.

Membership in the Colour Group

We give elsewhere (pp. 40-41) a summary of the proceedings at the inaugural meeting of the Physical Society "Colour Group," held on February 12, when the Constitution was presented and adopted. It will be noted that membership in the group is given free to members of the Physical Society (the body responsible for its initiation), and that the subscription to be paid by the members of supporting societies, of which the Illuminating Engineering Society is one, is 5s. per annum. For others the subscription is half a guinea. Doubtless there will be a number of I.E.S. members in the same position as the chairman of the group (Dr. W. D. Wright) in being also members of the Physical Society, and therefore eligible to join without subscription. We should, however, be pleased to hear from other I.E.S. members who may wish to join; alternatively, they may make application direct to the honorary secretary, Mr. H. D. Murray (1, Lowther Gardens, S.W.7). The proceedings at this first meeting certainly suggest that the Colour Group will have no difficulty in finding plenty of material for discussion.

Daytime Lighting Requirements of Traffic Subways

Recommendations for the illumination of traffic subways during the daytime, a problem more frequently encountered in the United States than here, are presented in graphical form in the "Recommended Practice of Street Lighting," issued by the American I.E.S. (Trans. Illum. Eng. Soc., U.S.A., Jan., 1941, p. 41). The diagram shows the distribution of light due to daylight penetration and the value of the artificial illumination for borderline seeing and safe seeing (minimum and recommended), over the distance between the entrance to the subway and 200 ft. inside. In this field daylight alone must be judged ineffective, as it comes well inside the borderline. The curve showing recommended values diminishes from 200 ft.c. at the entrance to rather more than 50 at 100 ft. inside, and, finally, tapers down to the general interior value at the limit of 200 ft. The need for a high value near the entrance, which in practice usually attains about 100 ft.c., is evidently necessary to prevent too sudden contrast with the daylight outside. It is judged that the provision of the conditions of illumination noted, over a distance of 200 ft., allows time for the eye to adapt itself to the interior lighting, for driving speeds up to 35 miles per hour.

Shadows in Industrial Lighting

We have before us a memorandum on this subject prepared by Dr. K. Norden, who is a recognised authority on shadows and their measurement. To this we hope to return in a subsequent issue. For the moment it may be pointed out how very general is the treatment of shadows met with in industrial operations. The official reference, embodied in the Factories (Standards of Lighting) Regulations, is as follows: "Adequate measures shall be taken, so far as reasonably practicable, to prevent the formation of shadows which cause eye-strain or risk of accident to any person employed." Here we see the difficulty in defining quality of lighting in its most evident form. Although we have no positive ready test of whether an installation is "glaring" or not, it has been found possible to limit glare in factories very materially by the adoption of numerical data in regard to brightness and position of sources. This is done in Paragraph 3 of the Order. The effect of shadow, however, depends not only on its density, size, and sharpness, but on its relation both to the actual task and the surroundings. Shadow-effect, being dependent on contrast, and thus a sensation, cannot be exactly translated into numerical terms. It might, however, be possible to define objectionable shadows more definitely than at present. The problem illustrates once more the need to supplement "codes" of foot-candles by descriptive information bearing on quality of lighting.

Better Street Lighting?

From time to time the public is given a somewhat tantalising assurance that better street lighting is on the way. In the House of Lords recently Lord Snell intimated that some degree of improvement might be expected before next winter, without appreciably increasing the degree of visibility from the air. Whilst little has been made public in regard to recent research in this field, it may be taken for granted that experts are now in a position to assess with very fair certainty what the effect of any particular change would be. Concessions might perhaps follow the general lines suggested in the recently issued Report on War Time Street Lighting. Even a comparatively small increase in light would be well worth having, especially if combined with the judicious use of reflection in order to improve contrast. In this connection it is most interesting to observe how the fundamental ideas expressed in that report are impressing themselves on the public consciousness. An instructive case was that of the lady who recently injured an eye by walking into the sandbag wall of a local air raid shelter. She contended that the Borough Council were negligent in not lighting or whitewashing the sandbags—omissions that were rectified shortly afterwards. Ultimately the judge decided that it was the lady who had shown negligence. After her emergence from a brightly lighted interior where her hair had been receiving attention "she should have walked slowly or stood still until her eyes had become accustomed to the darkness," a legal recognition of the duty of the public to cultivate dark adaptation, and surely a significant sign of the times.

Special Lighting Problems

In these busy days, when the services of lecturers prepared to furnish a paper for a full evening are sometimes hard to secure, and when journeys to a distance may present difficulties, the "problems" meeting seems likely to come into its own. We recently remarked upon the successful meeting on these lines organised by the North-Western Local Centre. The sub-Centre in Nottingham seems to have been equally fortunate with their effort on the 21st of last month. It is true that the audience was somewhat below average—but we have always held that time devoted to discussion of knotty problems by only a few enthusiasts is time well spent.

We hope to give a fuller account of some of the contributions at this gathering, over which Professor H. Cotton presided, very shortly. In the meantime, readers will be interested to note the variety of problems presented:—

(1) The provision of high intensity (50 ft.c.) illumination for colour matching, equivalent to clear north daylight.

(2) Lighting conditions to enable bottles containing liquids to be inspected, with a view to detecting undesired particles of matter, the liquids being of various densities and colours.

(3) The lighting of a small cost office where much close work is done with copying ink pencil.

(4) The illumination of a large drawing office, equipped with fixed horizontal and moveable tilting drawing boards and large filing cabinets.

(5) The provision of efficient and reliable supplementary lighting for needle points of sewing machines in garment factories.

Mr. J. B. Sanderson was responsible for introducing topics (1) and (5), Mr. C. C. Barnes for (2), Mr. W. S. Thwaite for (3), and Mr. C. S. Caunt (the hon. secretary) for (4). Mr. Howard Long and Mr. C. J. Allderidge furnished supplementary expert opinion on the various problems.

A Special Purpose Photometer

Readers may recall our description, some months ago, of a photometer somewhat hastily assembled to facilitate the testing of motor-car headlights*, and our subsequent reference to the use of photometry by the Police in Bedfordshire in order to check compliance with War-Time Lighting Restrictions (Lights carried by Road Vehicles). This Order specifies an upper limit for the amount of light to be given by motor car headlamps, viz., 2.5 ft.c., measured at a distance of 10 ft. "from the headlamp."

It might be thought that photometry was somewhat beyond the ken of members of the police force, to say nothing of the Bench of Magistrates. Anticipating this difficulty, the Ministry of Home Security approached Messrs. Everett, Edgcumbe and Co. as regards the development of a special direct reading photometer for the purpose. The instrument shown in the accompanying illustration was the result. An "autophotic" cell forms the sensitive receiving surface and is mounted on one side of a strong oiled teak box measuring only 3 in. each way. On the top of the box and protected by a flap lid is the moving-coil indicator, scaled to read direct from 0-5 ft.c. To use the instrument, it is only necessary to hold the sensitive surface vertically in the beam at a distance of 10 ft. from the lamp and to read off the illumination on the foot-candle scale.

The illumination given by a motor-car headlamp necessarily increases when the battery is charging. It has been suggested, therefore, that the measurement should be made with the engine running at such a speed that the indicator on the dash-board shows that charging has commenced, which will probably correspond to a road speed of 15 to 25 miles per hour.

We understand that practically all the police authorities throughout the country are being provided with one or more of these instruments, and that a number of motorists have already been fined for contravening the regulations.

Although we are referring here to the use of the instrument in connection with the testing of motor car headlights, there will no doubt be many other possible applications.

White Lines and Black Buildings

As a safeguard for fire-watchers, several of whom have recently been killed by falls from the tops of buildings, the use of white paint to indicate the position of roof-edges is now being adopted. Arrows pointing towards the safety zone and white circles to indicate the presence of obstructions are also being used. This is in line with methods adopted in dockyards and in railway stations. One is glad to note the assurance of the authorities that such devices do not make buildings any more visible from the air. At the same time, it is interesting to notice the order, recently introduced in Germany, to the effect that outside walls and facades of buildings must no longer being painted in light colours. One could understand that a single white building of large dimensions might stand out sufficiently in moonlight to be recognisable. One would hardly think, however, that the same objection applied generally to vertical surfaces. At the present very low level of war-time street lighting in use in this country, one is inclined to recommend the use of light paint for vertical surfaces, at least near the ground, and at important crossings, etc., so as to obtain a maximum of contrast.

* "Light and Lighting," Oct., 1940, p. 164.

Colour: Its Production, Use and Specification

The First Meeting of the Physical Society Colour Group, held at the Polytechnic, Regent-street.

In the September number of "Light and Lighting" it was announced that the Physical Society had formed a "Group," to be called the Colour Group, which would meet from time to time under the aegis of the Physical Society to discuss problems connected with colour in all its aspects. Membership would be open, not only to scientific workers, chemists, and physicists, but also to industrialists, the producers and users of coloured materials, so that a common platform would be provided for the interchange of ideas and experience by all those interested in colour from any and every point of view.

A preliminary meeting was held in May last to consider and decide upon a suitable constitution for the Group and to work out the modus operandi, at any rate, for the initial stages. At this meeting the objects of the group were formulated as follows:—

(i.) to provide an opportunity for the various groups of people concerned with colour—physicists, chemists, industrialists, etc.—to meet and become familiar with each other's problems;

(ii.) to enable a representative opinion to be formed on various questions of standardisation, specification, nomenclature, etc.;

(iii.) generally to encourage colorimetric investigations and to ensure that this country shall keep abreast of developments abroad.

It was decided to appoint a chairman, an honorary secretary, and a small committee to conduct the affairs of the Group, and the following appointments were made:—

Chairman—Dr. W. D. Wright (Imperial College of Science).

Hon. Sec.—Mr. H. D. Murray, 1, Lowther Gardens, S.W.7.

Committee—The officers and Messrs. J. Guild (N.P.L.), J. G. Holmes (Messrs. Chance Bros. and Co.), and H. W. Ellis (Clayton Aniline Company).

It was further decided that membership of the Group should be open (a) to members of the Physical Society, without subscription, (b) to members of certain other technical or scientific societies on payment of an annual subscription of 5s., (c) to others on payment of an annual subscription of half a guinea. The societies referred to under (b) are at present as follows:—

The British Kinematograph Society,
The Illuminating Engineering Society,
The Institute of Physics,
The Royal Photographic Society,
The Society of Glass Technology, and
The Society of Dyers and Colorists;

but it is proposed to invite other societies to have their names added to this list, and, as will be seen later, one such addition has already been suggested.

Adoption of the Constitution.

It was originally intended that the first full meeting of the Group should be held about the middle of October, but for various reasons this was found not to be practicable, and the meeting was actually held on Wednesday afternoon, February 12, at the Polytechnic, Regent-street, W.1. There was a very good attendance, some sixty to seventy members being present, among them a number of members of the Illuminating Engineering Society.

Dr. W. D. Wright took the chair at 2 p.m. and explained that the proceedings would be divided into two parts, viz.: (i) the business matters connected with the formation and operation of the Group, and (ii) the presentation and discussion of certain papers dealing with the problem of "Colour Tolerance" from different points of view. He gave an outline description of the way in which the idea of a Colour Group had arisen from the fact that so many people were interested in the problems of colour in a variety of ways. Unless they could be brought together for an exchange of views and so come to a realisation of one another's problems, there was a considerable risk of their continuing to work in water-tight compartments, and so, for instance, the industrialist might lose much of the benefit of the progress made in the scientific study of colour problems, while the physicist might fail to have a proper picture of the colour problems confronting the industrialist.

Dr. Wright then went on to describe the initial steps taken to start the Group, and he read out the draft Constitution which had been prepared at the preliminary meeting in May, and which had been circulated to all who had applied for membership of the Group. This Constitution, incorporating the objects and qualifications for membership set out above, was adopted without modification, and the officers and committee, provisionally appointed in May, were formally elected. Mr. J. F. Stanley, of the British Standards Institution, drew attention to the fact that item (ii) of the Objects, including as it did standardisation and specification, was closely analogous to the work of the B.S.I., and he expressed the hope that in such matters the Group would work in close collaboration with the Institution. The Chairman assured him that this would be carefully looked after.

With regard to the list of societies associated with the Group, the suggestion was made that an invitation might be sent to the Physiological Society, who, it was pointed out, were particularly interested in problems connected with colour-blindness. Several speakers urged the desirability of having the colour vision of all school children examined as a matter of routine, and some astonishing instances were given of colour-blind people who held responsible positions in commercial undertakings and in whose work colour discrimination played an important part.

The Chairman then read a letter from Dr. Ferguson, President of the Physical Society, in which he said that the rapid development of physics in recent years had made it necessary to consider the formation, within the Society, of specialist groups of those interested in particular branches of physics. The Colour Group was the first to be formed, and on behalf of the Society he wished it every success.

Colour Tolerance.

For the second part of the meeting the chair was taken by Mr. J. Guild. There were four papers on different aspects of colour tolerance, the first being by Dr. Wright, who surveyed the field generally and pointed out that "tolerance" was inevitably a somewhat indefinite matter. There were not only the individual opinions of various people to be reconciled, but there were also the limitations imposed by practical considerations. Although very small tolerances might be practicable in the sense that it was *possible* to work to them, yet economic considerations might rule them out completely. Tolerances, too, depended very much on the purpose for which the colour was required; a difference which in certain

circumstances was quite acceptable might well be intolerable under other conditions of use.

The second paper, dealing with the "Technical Aspect of Colour Tolerance," was by Mr. H. W. Ellis, of the Clayton Aniline Company, Ltd., but in his absence through illness the paper was read by his colleague, Mr. Wild. The changes of colour due to very small differences in concentration of dyestuff were described and samples were exhibited showing the effect in the case of certain colours. The author mentioned that in his experience the trained eye was superior to any instrument for the detection of small colour differences. The observations, he said, were made by daylight—actually a north sky light—and this remark gave rise to a discussion in which several members, including Mr. L. G. Applebee, Mr. R. S. Wilson, and Dr. J. W. T. Walsh, took part. It was pointed out that unless materials were matched under conditions closely similar to those under which they were to be used, there was considerable risk of dissatisfaction. In this connection the necessity for a standard illuminant for matching purposes was stressed, and reference was made to the British Standard Specification for Artificial Daylight Fittings for Colour Matching. It was stated that this specification was now in draft, and would be published shortly. Mr. Applebee pointed out that for certain, e.g., theatrical, purposes it was not a daylight but an artificial light which was needed in order to simulate the conditions of use.

Mr. R. S. Wilson, of the British Colour Council, then read a paper dealing with the "Commercial Aspect of Colour Tolerance." He began by reading from a book in which the author lamented the absence of a method of specifying colours, and expressed surprise that such a simple and obviously useful thing had been so completely neglected. That

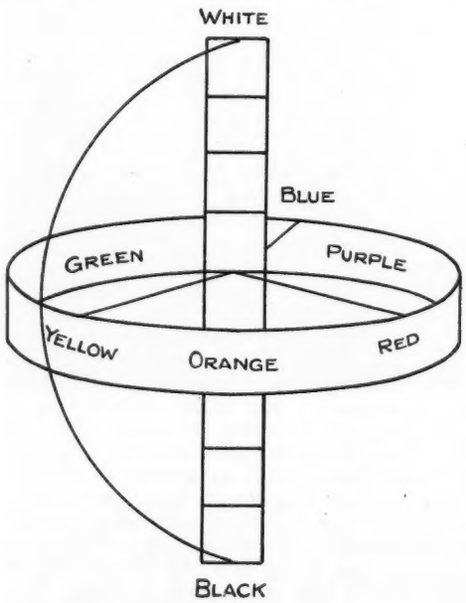


Fig. 1.

book, said Mr. Wilson, was published in 1814. The speaker then went on to describe a method of specification based on a form of "colour-solid" like that shown in Fig. 1. The central vertical represented all colourless shades from white to black, while the outer equatorial band represented the colours red, yellow, blue, and their subtractive combinations, orange, green, and purple. The line of longitude passing through any particular colour on the equator represented different tones of that colour from very light to very dark, while points inside the solid represented colours with different degrees of saturation, i.e., greater or less admixtures of colourless grey.

Mr. Wilson gave an account of some of the work undertaken by the British Colour Council, and he exhibited a number of cards of samples which the Council had prepared for different industries. He pointed out the important rôle played by the material taking the colour, and showed that it was necessary to have cards of samples in which the coloured material was the same as that for the standardisation of which the card was to be used.

The fourth paper, by Mr. J. W. Perry, of Messrs. Adam Hilger, Ltd., dealt with the "Physical Aspect of Colour Tolerance." The author first outlined the different methods of specifying a colour. The spectral distribution curve was the most complete of these, but, although it might be possible to lay down tolerances expressed as limits on the curve, this was by no means simple either to devise or to apply in practice. The hue-and-saturation method had much to commend it as a method of colour specification, but, again, to specify satisfactory tolerances on this system was a matter of some difficulty. Probably the system of colour description best suited to the specification of tolerance was the trichromatic system. On this system any colour could be represented by a point on a colour diagram such as that

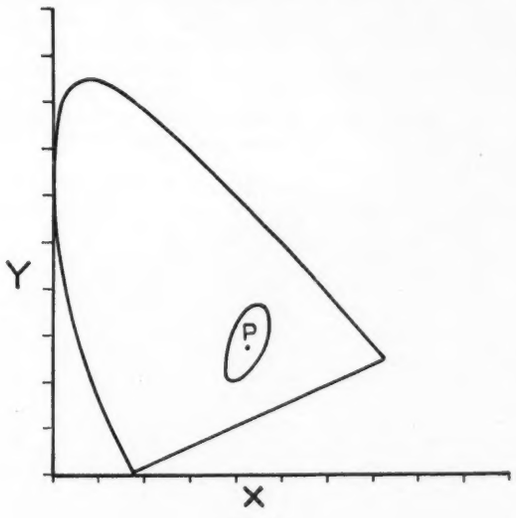


Fig. 2.

shown in Fig. 2. If P represented a given colour which could be matched by means of a mixture of three primary colours in the proportions X, Y, and (1-X-Y), then the co-ordinates of P on the diagram were X and Y. On this system it was possible to represent the tolerances on a colour by tracing around P a curve such that all the colours represented by the points on this curve would be acceptable as not departing too greatly from the original colour represented by P. It was found that in actual fact the tolerance curves were approximately elliptical in form, and by suitable means the colour diagram could be projected so that the tolerance curves became approximately circular. If, then, on this projected diagram the tolerance on X alone was equal to (x) while that of Y alone was equal to (y), clearly the tolerance on X and Y in combination was $\sqrt{(x)^2 + (y)^2}$, the radius of the (circular) tolerance curve on the projected diagram. (It is understood that Mr. Perry's paper may be published in full in the Proceedings of the Physical Society.)

A short discussion followed the presentation of these four papers, and several members present expressed their satisfaction at the opportunity to exchange points of view which was provided by the meetings of the Group. The Chairman asked that anyone who had material available for a paper to be read at a future meeting should communicate with the Hon. Secretary, Mr. Murray.

The meeting adjourned at 4.30 p.m.

Photographic Studio Lighting

Summary of a paper by Sub.-Lieut. J. T. Grundy, R.N.V.R., presented at a meeting of the I.E.S. North Western Local Centre on December 12, 1940.

The rapid advances made in the development of photography in the last few years has certainly been equalled by the lighting industry. Unfortunately, however, the two have not gone hand in hand.

The film studios and commercial art studios are, generally speaking, in a highly developed state as regards their lighting, but we still find the ordinary family portrait photographer hanging what he persists in calling half-watt lamps in all inconceivable places.

We must bow to the fact that photography was known long before electricity, and therefore has its traditions. The general principles have been known since the days of the alchemists, experimenting with chloride of silver. It is not necessary to go deeply into the developments of illuminating engineering. We have the ordinary gas-filled lamps with their efficiency of twelve to fifteen lumens per watt, the high-pressure mercury vapour lamps with efficiencies of thirty-five to forty-five lumens, and the Bi-post Filament high-wattage lamps with relatively high efficiencies. All these are available for use in photographic studios.

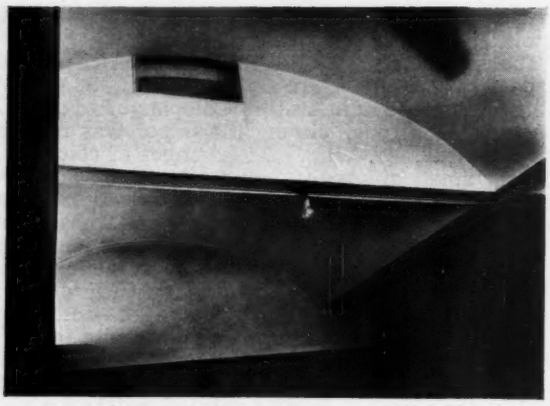
There are at the present time a number of methods of utilising these sources. Firstly, we have the ordinary bowl reflector, with a sand-blasted or white enamelled interior to soften the light. This usually takes a 500-watt photographic lamp, and two are normally used to give a balanced effect. Normally the reflectors are placed ten to fifteen feet from the subject. Next we have the higher wattage pattern, customarily known as the "Broadside" reflector, and accommodating a 1,000-watt or 1,500-watt lamp. Both these types are on floor telescopic type stands, and have the advantage of mobility.

Following on these, we produce the overhead trough reflector, parabolic in shape, fitted with four to five 1,000-watt lamps. These are usually mounted eight to fifteeen feet high, and can, of course, be tilted. The author does not favour this type, as it usually helps to produce a very "flat" photograph, and cannot be used to develop any light and shade on the features of the subject. It has, of course, the virtue of unobtrusiveness.

Developed from these, we have the broadside reflector incorporating a 400-watt high-pressure mercury vapour lamp and two 300-watt gasfilled lamps. This is of particular use in connection with colour photography. Under normal circumstances filters are used to cut out the unwanted parts of the spectrum. This naturally lengthens the time of exposure, and as no one appears to be able to stare at a camera for half a second, often produces poor results. With the lamp combination previously mentioned, however, the use of filters is eliminated, due to the light being practically balanced to daylight—i.e., without the preponderance of red found in gasfilled filament lamps. Added to this, mercury vapour lamps have a high actinic value.

These are the patterns most commonly used in studios to-day. There are the super effect lighting reflectors, the high candle-power broadside reflectors, the narrow beam projectors using Bi-post Filament lamps, and several others, but little is seen of these on the grounds of economy.

Whilst it is usually possible to utilise the standard reflectors to good advantage, occasionally strange problems present themselves. A case in point was the photographing of fingerprints. These prints are found everywhere, on chairs, doors, and tables, etc.



A photograph of the specially shaped false ceiling illuminated by lamps in the wiring channel on the left. The lamps consisted of two 100-watt "Horizon" lamps and two 400-watt "Osira" "U" lamps, spaced at 3 ft. centres.

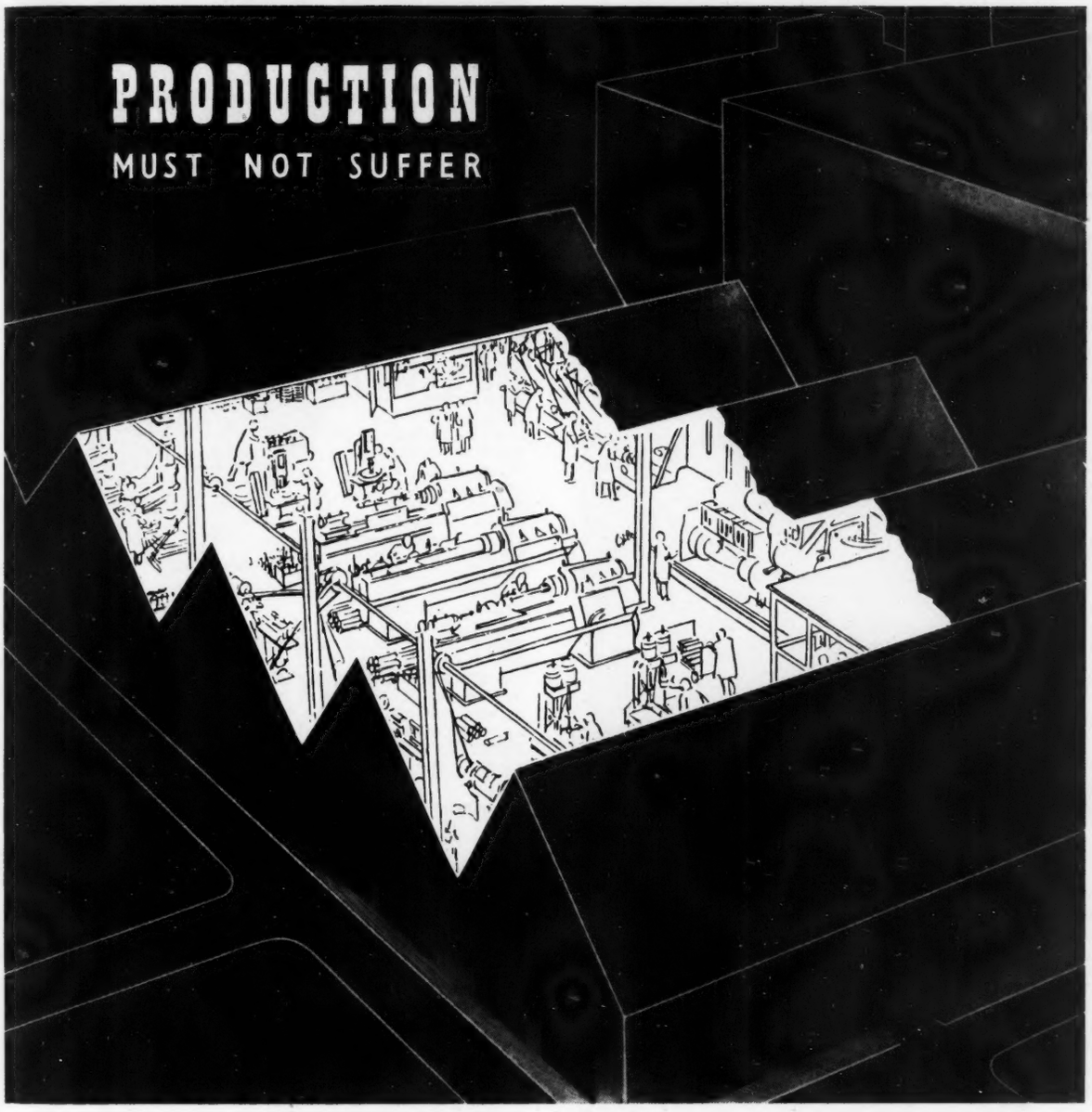
The photographer in question mentioned a special difficulty met with in connection with this problem, which was the scorching of highly polished surfaces owing to the amount of light he had to bring close to the object to obtain the high precision photograph required. The solution of this problem presented difficulties. Miniature spotlights and low voltage car lamps were experimented with, all to no effect. The ideal arrangement was eventually produced, using two 125-watt high-pressure mercury vapour lamps in parabolic reflectors. Owing to the high actinic value and the high efficiency, the exposure time was reduced by 100 per cent. Another method, incidentally, of photographing finger prints is by using fluorescent powder and a mercury vapour black bulb lamp.

However, these instances are rather off the beaten track, and we come back to the more respectable studio, with which we are more familiar. Most people will confess that a visit to a photographer is regarded with something of the embarrassment credited to the dentist.

The reason probably lies in the posing which has to take place; the inevitable fussing around by the photographer with his lights, generally covered with translucent muslin to soften the shadows on the subject's features. During all this process, the subject's expression changes to one of complete resignation as of one preparing to be shot.

The orthodoxy in every studio seen rather dismayed the author, until he was approached one day by Mr. Budd, of Rochdale, who had rather a good idea for improvement. He had decided that in nature photography one relied entirely on natural light, so why not transfer the same effect into the studio? The studio in question was approximately twenty feet square, with an annexe of about twenty feet wide and ten feet long. The annexe was not to be considered for lighting, and after careful consideration it was decided to construct a dummy ceiling, and use the beam crossing the ceiling between the main studio and the annexe to house the lamps. The dummy ceiling was designed by the usual method of "Build up," aiming at throwing the majority of the light downwards towards the subject, and at the same time giving a decorative effect insomuch as the whole ceiling had an even diffusion of light.

The choice of lamps presented a problem, and it was finally decided to utilise 1,000-watt horizon-type aerodrome lamps and horizontally burning, high-pressure, mercury vapour lamps. Two of each were used, spaced alternately in the recess of the beam, at the same time constructing a trough with the end of the dummy ceiling. Roughly, the consumption was 2,800 watts, which is not high for the average studio. The chokes and condensers required were hidden in a convenient recess. The efficiency of the ceiling,



Blackout conditions will lower your production rate unless your lighting is properly planned. If other duties restrict you from giving full attention to this vital matter, the Crompton Illumination Service will be glad to take the responsibility off your shoulders, without fee or obligation.

Have the job well done—do it yourself or call in Crompton Parkinson

THE CROMPTON ILLUMINATION SERVICE is now available at BELFAST · BIRMINGHAM · BLACKBURN BRISTOL · CARDIFF · CARLISLE · EDINBURGH · GLASGOW · LEEDS · LIVERPOOL · LONDON · LUTON MANCHESTER · NEWCASTLE · NOTTINGHAM · PORTSMOUTH · SWANSEA. Your enquiry, either by letter or telephone, will receive immediate attention.

CROMPTON PARKINSON LTD.

ELECTRA HOUSE · VICTORIA EMBANKMENT · LONDON, W.C.2

Telephone: Temple Bar 5911 & 2444 *Telegrams:* Crompark, Estrand, London

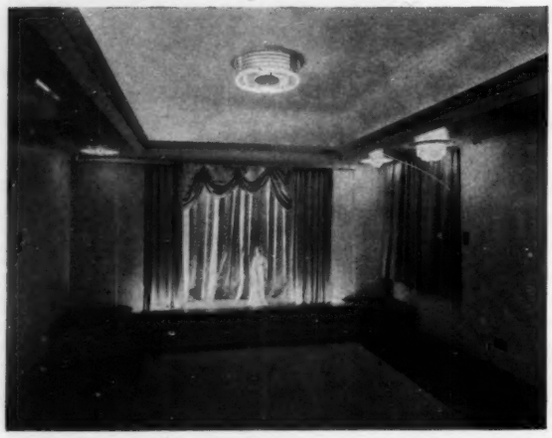
painted matt white, is approximately 84 per cent. Naturally, this has to be painted fairly frequently to maintain this efficiency and high reflection factor.

From the Illuminating Engineer's point of view, the lighting is good, and there is just that slight bit of modelling necessary which is the joy of the photographer's heart. Therefore Mr. Budd occasionally uses a small 500-watt effect reflector, placed on the left-hand side of the subject, to give a slight sunlight effect.

Under normal circumstances a panchromatic plate is used for speed, and a thirtieth of a second exposure can be obtained at F6.

Whilst the lighting is not perfect, the method may be regarded as a great step forward in the better co-operation between the lighting engineer and the photographer. The units are totally unseen, and what they lack in mobility they make up for in natural effect.

Developments in South Africa



We illustrate above the new miniature theatre in the recently extended Magnet House of the General Electric Company, Ltd., in Johannesburg, South Africa. The theatre is specially designed for the display of stage lighting and other effects.

Obituary

Mr. E. L. Oughton

We record with regret the death of Mr. E. L. Oughton, which occurred on March 1, following a sudden operation. Mr. Oughton was a member of the Illuminating Engineering Society of long standing. He was at one time a Member of the Council. He served on the Joint Committee concerned with the lighting of schools, and in 1931 he read an excellent paper reviewing progress in gas lighting. He was also a member of the Institution of Gas Engineers and of the Institution of Heating and Ventilating Engineers. At the time of his death he occupied the position of District Research Officer to the South Suburban Gas Company. Besides being an able engineer with wide interests, Mr. Oughton had a very kindly and genial disposition, which gained for him many friends outside the gas industry. His loss will be generally regretted.

Mr. H. A. Pryor

By the death of Mr. H. A. Pryor, on February 25, the Illuminating Engineering Society loses another of its early members. He had been associated since 1908 with Messrs. Siemens Electric Lamps and Supplies, Ltd., of which he was for many years advertising manager, until, from 1923 onwards, he became manager of the company's Manchester branch.

Mr. E. A. Marx

Mr. E. A. Marx, who passed away last month, was also an I.E.S. member and was also associated with Siemens Electric Lamps and Supplies, Ltd. He joined the London office of the company in 1926, and became branch manager at Leeds in 1931.

A Local Lighting Attachment

In recommendations on factory lighting special stress has been laid on the screening of local lighting units which, being so near to the eyes of the worker, are liable to cause particularly troublesome glare if the source is not screened from view. Well designed and properly located units should be free from this fault—though, admittedly, there are cases in which, owing to the tilt of the fitting for some special object, it is difficult to secure complete immunity for everyone. Many fittings in common use, otherwise satisfactory, are too shallow to screen the source effectually. A new detachment introduced by the British-Thomson Houston Company, Ltd., and here illustrated, should therefore prove of service. This "Mazdalux L.S.B." (low surface brightness) attachment comprises a diffusing screen, which is obscured from the view of the operator by means of the flexible composition skirt. The diffusing screen is, however, itself of relatively low brightness. Besides diminishing greatly the possibility of "direct glare" in the eyes of workers, it therefore also performs the useful service of lessening the brightness of reflections of the light in polished material—thus eliminating the troublesome glitter sometimes described as "indirect glare," which is possibly the most widespread form at the present time.

Purchase Tax on Electric Lamps

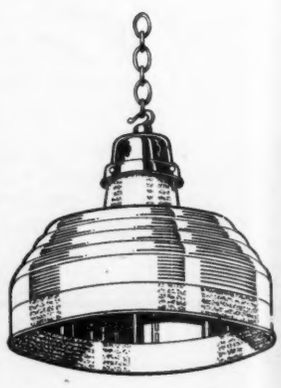
A difficulty has been experienced in connection with the purchase tax in connection with electric lamps, owing to the fact that decimals of a penny are involved. This is, naturally, inconvenient to the average retailer, who is unable to adjust his accountancy system to deal with half-pennies and farthings.

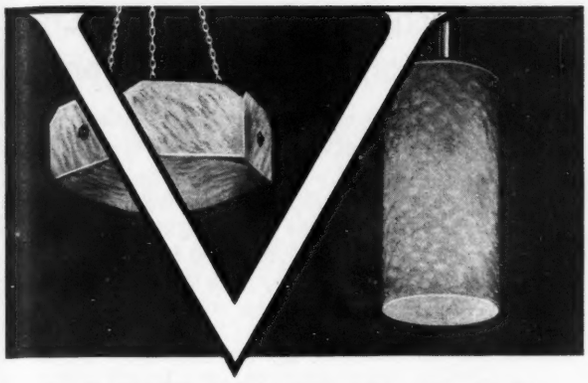
As a result of negotiations with the Central Price Regulation Committee the Electric Lamp Manufacturers Association has obtained agreement that the tax chargeable to the public may be passed on in round pence. The figures for the tax chargeable, which, in general, varies between 5d. for 15-25-watt Pearl lamps and 1s. 5d. for a 200-watt clear lamp, are set out on a card which the E.L.M.A. is now issuing.

The tax as charged to retailers remains unchanged, and is worked out on the strictly net basis of 26 per cent. of the total list value of the invoice (except for Kye lamps, where it is 22 per cent.).

An Industrial Lighting Fitting

We illustrate herewith a useful form of industrial lighting fitting, one of the latest products of G.V.D. Illuminators, Ltd. The design has good diffusing qualities and pleasing appearance, and whilst emitting the main illumination downwards, has the merit of allowing a fair proportion of light to reach the walls and ceiling—thus preventing the "tunnel effect," which is apt to prove tiresome, especially when factories are blacked out completely and artificial light is almost exclusively used. The diameter of the fitting is 15 in. and it is adapted for 100-500 watt lamps.





VITREOSIL
TRANSLUCENT
BOWLS *and* CYLINDERS

Improvements in factory lighting have been accelerated by the war. This progress will certainly influence home and other interior lighting arrangements—and increase the use of VITREOSIL translucent bowls and cylinders. They present an exclusive satin-like sheen of unique decorative value in high class interior installations, and allow excellent illumination free from glare.

Sole Manufacturers :

THE THERMAL SYNDICATE LTD.

Head Office and Works: Wallsend, Northumberland
London Depot: 12/14, Old Pye Street, Westminster, S.W.1

Test *for* Night Vision

by W. D. Wright

D.Sc., A.R.C.S., Lecturer in Physics, Imperial College of Science and Technology

Dr. W. D. Wright, D.Sc., A.R.C.S., well known for his work on vision for the Medical Research Council, has just perfected a simple apparatus which is of the utmost value in connection with scientific investigations on vision. It is a test for night vision, based on the principle of fixed illumination, reduction being obtained from a series of cards on which a broken circle is printed in shades varying from white to dark grey, on a black background.

The test has been designed as a result of observations made on many hundreds of persons, and Dr. Wright's comments on the special uses to which the test can be put are available in an accompanying handbook.

Those engaged on research in connection with problems of street lighting in the black-out and on illumination for industrial concerns will find Dr. Wright's apparatus an indispensable aid in their investigations. The price is **25s. net** complete with handbook (25s. 7d. by post). For further particulars, write to Pitman's.

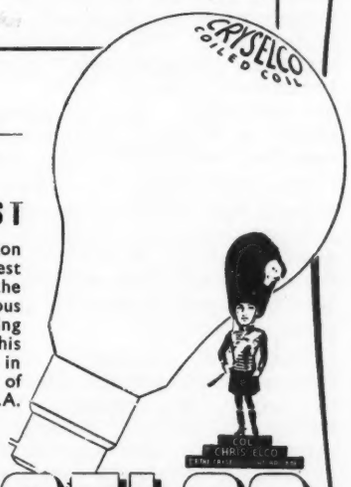
25s. net

Published and produced by Pitman's, Parker Street, W.C.2

PETER PAN

Light ON THE PAST

This statue in Kensington Gardens is one of the best loved in London. It is the only statue of a fictitious character erected during the life of the writer. This charming conception in bronze is the work of Sir George Frampton, R.A.



CRYSELCO LAMPS

Lamps of Enduring Brilliance

CRYSELCO LIMITED, KEMPSTON WORKS, BEDFORD

The Illuminating Engineering Society (U.S.A.)

Notes on Transactions (February, 1941)

NEWS: A new I.E.S. chapter has been formed in Oregon (U.S.A.). Further photographs of secretaries of sections and chapters are presented. In some forty-five cities, where the membership is insufficient to justify the establishment of new sections or chapters, local representatives have been appointed. Meetings of the Inter-Society Colour Council are to be held in Washington on March 4 and 5. A series of papers has been prepared. For the fourth successive year a prize for the best solution of a problem involving architectural lighting is being offered at Columbia University. An appeal for men to fill engineering posts in connection with the National Defence Programme has been issued. A description is given of the illuminated cascade and fountain, dedicated to California writers, in the Joaquin Miller Park, in Oakland, California. The use of floodlighting for protection against night sabotage has been emphasised by Mr. A. F. Dickerson, who, in a recent lecture, discussed its main features and illustrated methods of dealing with specific problems.

CONTRIBUTIONS: *The Technology of Brightness Production by Near Ultra-Violet Radiation, by J. O. Kraehenbuehl and H. J. Chanon.* The paper discusses the distribution in the spectra of illuminants of radiation capable of exciting fluorescence and illustrates the response of such materials as canary glass, sulphides, and organic substances. Sources of U.V. radiation and filters for use therewith are reviewed, and the application to measurements of brightness of the Luckiesh-Taylor Brightness Meter is illustrated. The luminous response of commercial materials (lacquers, plastics, papers, carpets, etc.) is presented in tabular form. Units and nomenclature are discussed. Finally suggestions are made in regard to design of installations utilising fluorescent materials, and some numerical examples are given.

The Ultra-Violet Excitation of Fluorescent Compounds, by J. W. Marden and N. C. Beese. This paper is supplementary to that noted above. Spectrophotographs showing the nature of the response of various fluorescent materials are shown, and the region of the spectrum most favourable to excitation in various cases is discussed.

"Signs of Progress." (*Report of I.E.S. Committee on Progress.*) Brief notes on a number of recent developments in illuminating engineering in general accompanied by illustrations, are presented. The data are presented under various headings (New Light Sources, Lighting Equipment, Measurements and Applications, etc.), and the material is presented in a very readable form.

The Lighting of Photochemical Reproduction Processes, by R. E. Farnham. Available sources of light are reviewed and their application to projection printing, photo-copying, lithography, blue printing, etc., are considered. The illumination requirements of various photochemical reproduction processes are presented in a comprehensive table, particulars of process, nature of sensitive material, source of light, incident radiation and appropriate exposure are given. Graphs show sensitivity throughout the spectrum of various emulsions.

Modelling with Light, by H. L. Logan. The paper explains methods of determining the specification of the special artificial luminous environment required for the display of sculpture. A series of illustrations relating to specific problems is presented. the lighting layout being set out side by side with a photographic illustration of the display in each case.

New Methods of Increasing Light Transmission of Optical Equipment

At every air-glass surface of a lens or mirror a loss of about 5% of the incident light is experienced. The greater the number of air-glass surfaces in an optical system the greater this loss, and in the case of a modern photographic lens with eight surfaces this loss reduces the transmission of the lens to only 60%. A periscope or range finder, with perhaps twelve or fourteen surfaces, suffers even worse.

Work carried out by Strong ("J. Opt. Soc. Amer.," Vol. 26, p. 73) followed up the discovery by H. L. Taylor in 1892 that some tarnished lenses showed a higher transmission than new lenses of the same type. Taylor evolved some chemical treatments by which lenses could be artificially "tarnished," but the processes were not of commercial value. Strong, however, starting from theoretical grounds, showed that the ideal "tarnish" was a film ¼ wavelength in thickness, the refractive index of the film being equal to the square-root of that of the glass on to which the film is to be deposited. This required a film whose refractive index was only 1.25, which is lower than that of any solid of practical value for the purpose. By evaporating a thin film of fluorite on to the glass surface using a high vacuum technique it was found that the lower surfaces of the film had a refractive index of about that of the glass, whilst the upper surfaces had a very much lower refractive index due to the film being porous in its upper layers. It was found that whilst this porosity did not scatter light, it produced a film of the correct characteristics, and plates treated in this manner showed a loss of only 1% in light transmission.

Another process directed to the same end is that of Blodgett ("Phys. Rev.," Vol. 55, p. 391). In this case a very delicate film of cadmium arachidate is deposited on the glass surface, the desired refractive index being again obtained because the film is porous. These films are, however, extremely delicate, and the process is not yet on a commercial basis.

As a result of the work of Strong and also of Cartwright and Turner ("Phys. Rev.," Vol. 55, p. 595, and "J. Opt. Soc. Amer.," Vol. 30, p. 110), a series of lenses for taking and projecting motion pictures have been manufactured ("J. Soc. Mot. Pict. Eng." Vol. 35, p. 3 and p. 89). These show all the remarkable advantages that can be predicted from theoretical considerations. For example, an eight-surface projection lens shows an increase in transmission of the order of 40%, whilst taking lenses showed a comparable increase, i.e., of the order of half a "stop."

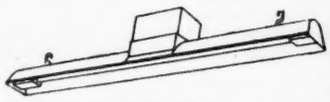
Even more valuable than this increase in light transmission are the increases obtained in definition and resolving power of the treated lenses, and, in the case of the photography of scenes which include bright sources of light, the very much reduced ghost and flare images, with the consequent improvement in image contrast and brilliance. These considerations also apply to projection practice, where the use of treated lenses increases screen illumination and produces better quality of the projected picture.

The application of the processes to the manufacture of microscopes and binoculars should show even greater advantages, in view of the larger number of air-glass surfaces involved. The increase in image contrast should prove especially valuable in the use of binoculars.

The processes have attracted considerable attention in America, where one of the leading optical manufacturers is attacking the problem on a production basis. In order to avoid damage to the rather delicate films some of the new lenses are being evacuated and sealed-up, so that no cleaning of the surfaces is necessary. R. G. H.

FIVE FEET OF PUREST DAYLIGHT!

THE NEW
MAZDA FLUORESCENT LAMP
80w. 60"
with
MAZDALUX EQUIPMENT



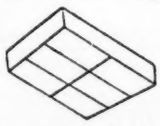
Cat. No. F.107. Standard Mazdalux Industrial Lighting Fitting with Control Gear.

Cat. No. F.108. Mazdalux Industrial Lighting Fitting without Control Gear.

Cat. No. F.120. Mazdalux Fitting for general lighting.

Cat. No. F.127. Mazdalux Fitting — 2 lamp type — with control gear — for Industrial Lighting.

Cat. No. F.128. Mazdalux Fitting — 2 lamp type — without control gear — for Industrial Lighting.



Mazdalux "Laylight" Fitting designed to counteract effect of permanently blacked out roofs.

IMPORTANT DEVELOPMENT IN BTH LIGHT-CONDITIONING

— a low-surface brightness lamp which makes possible for the first time the achievement of industrial lighting of **DAYLIGHT** quality and intensity at economical running cost. This new system of lighting completely solves all problems of glitter, diffusion and visual efficiency and is, by reason of its effect on output, a production tool of incalculable value.

Suitable fittings, scientifically designed by our Lighting Engineers, are available for all industrial lighting applications. Several are illustrated.

Full information on the Mazda Fluorescent Lamp and the complete range of fittings and accessories will be sent on request.

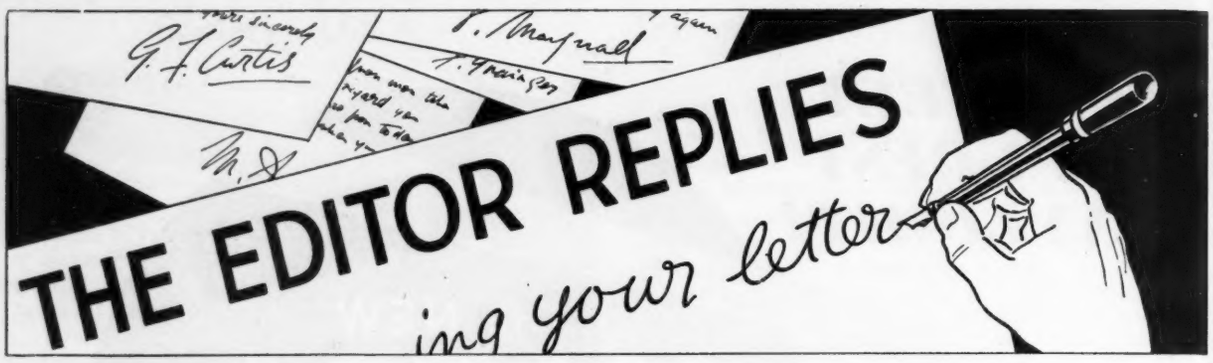
The MAZDA FLUORESCENT Lamp was developed in the BTH Research Laboratories. Let BTH Engineers plan the lighting installation for maximum production.

B T-H

3900

BTH for all Electrical Plant and Equipment

THE BRITISH THOMSON-HOUSTON CO., LTD., CROWN HOUSE, ALDWYCH, LONDON, W.C.2



I have been asked why, in some of the specifications relating to **Fittings to furnish Low Illumination** (0.002, 0.02, and 0.2 ft.c.), no specific form of fitting is made compulsory and no polar curve of light distribution is prescribed—whereas in the case of Fittings for War-time Street Lighting the polar curve is prescribed somewhat minutely and compliance with it is strictly enforced.

I think the chief explanation is to be found in the purpose which the lighting system serves. The "low intensity" fittings are not for general use, but only for adoption on certain premises (presumably private in most instances) where permission for their use must be sought from the authorities. Provided that certain fundamental conditions (such as keeping within the maximum illumination permitted and showing no appreciable light upwards) are met, it is not necessary to define exactly the way in which this illumination is secured, nor the nature of the fitting, nor the distribution of light, although advice on such points may be helpful. Moreover, lighting of this kind is usually under ready control and can be switched off on demand.

In the case of **War-time Street Lighting,** however, things are different. Permission to use this is universal (except for certain prescribed areas). It is intended for use in the public streets, and may be kept on continuously during air raids. It is, therefore, necessary to define exactly what is permissible and to make sure that all fittings in use fulfil the essential requirements.

Attention has been drawn to the problems involved in the application of the **Purchase Tax** to lighting fittings. Which are to be considered necessities—as surely apparatus for the proper distribution of artificial light should be considered—and which as serving a partly decorative object, and therefore luxuries? It may be assumed that industrial lighting fittings are not liable to tax, but, as the *Electrical Review* recently inquired, "What is an industrial fitting?" Apart from such misunderstandings as arise from the impression that concentric ridges, intended to improve the efficiency, have a decorative purpose, one may well ask whether a fitting for factory use should be taxable merely because it is not unsightly. This seems to be a question on which the authorities would benefit from expert guidance.

The I.E.S. Library. While a fair number of members resident in London or around make use of the library at 32, Victoria-street, it does not seem to be generally known that it is equally at the service of members in country districts. Books recorded in the published list (See I.E.S., *Transactions*, April, 1939, p. 53) can be sent by post on request, except for a few which are too valuable or too bulky to risk in transit. Members visiting London are welcome to call and choose. The room is occasionally in use for committees, etc., but it is almost invariably possible to gain access to the books.

Further experience of the **protective netting** attached to the glass **in public vehicles** has served to confirm one's original impression of the difficulty thus created in seeing through windows. In the tube railways, especially, the high interior illumination on the netting produces a "reversed contrast," making it impossible to see through the chinks. That this experience is general is shown by the fact that circular apertures have now been cut in the netting to facilitate vision

Following the references in our last issue (p. 32) to the use of a **photometer** in order to check compliance with the Lighting Order by **Motor Car Headlights,** it is interesting to note that a standard form of instrument serving this purpose has now been developed by Messrs. Everett Edgcumbe and Co., Ltd. A reference to this instrument appears on page 39.

It has recently been reported that in Germany the authorities are ordering the use of **blue lights,** in place of red, for the **rearlights** of motor vehicles. I am disposed to doubt the truth of this report. It has been suggested that the change might be based on the impression that blue lights are less visible from above, but this view does not seem to be generally held by scientific men. On the other hand, for distinctiveness at ground level blue is one of the worst colours to select, being notoriously difficult to discriminate from white at a distance.

Public notices in the daily Press continue to stress the value of **white armlets,** in order to render pedestrians more conspicuous in the black-out. So far as it goes this is quite a useful precaution. In view of the heavy street fatalities (exceeding 1,000 a month during the winter period), it is a little surprising that the authorities have not made the use of some such device compulsory, as *Roads and Road Construction* recently suggested. But it might well be urged that the size of an armlet, a glove, or even a scarf, is hardly sufficient. Apart from the fact that it may fall outside the main area of a headlight beam, an object of this size is too liable to come within the angle of non-perception of a dark-adapted eye (about 3°) at some little distance. It will be recalled that this angle, within which objects in very weak light are seen with difficulty, represents about 2½ ft. at a distance of 60 ft. For those who habitually go about the streets in the black-out a light coat or mackintosh seems the best choice.

Paper Restrictions

The shortage of paper and restrictions in its use are affecting all periodicals. In the case of "Light and Lighting" foresight in acquiring stocks at the outbreak of war, aided by judicious economy in their use, has so far made it possible for essential features to be maintained. From now onwards, however, the need for economy in paper will become more urgent. If further diminutions should prove inevitable, we are confident that readers will understand the position.

No Money Can Buy—No Man can Sell. Under this title the editor of *Signs* refers to the difficulties that have beset the sign trade since the outbreak of war. It was no doubt a foregone conclusion that with the coming of the black-out illuminated signs would vanish from the streets, but one cannot help wondering that the authorities could apparently see no way of utilising such a potent method of appeal to the public. No doubt the use of luminous signs out of doors at night is impossible, but on dull afternoons and under full control could not some effective use be made of them to stress the national appeals for service and saving?

In the meantime I salute the invincible doggedness which has enabled the Editor to continue his appointed task. It is not exactly easy to run a journal dealing with lighting in war-time, but to maintain one concerned with signs and outdoor advertising is prodigious!

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 34, February, 1941)

II.—PHOTOMETRY.

44. A New Determination of the Relative Luminosity Curve.
N. T. Fedorov, V. I. Fedorova, A. G. Plakhov, L. O. Seletzkaya. Journal of Physics, Academy of Sciences, U.S.S.R., Vol. III., No. 1.

The authors have redetermined the relative luminosity curve for pure photopic vision under conditions of light adaptation. They claim that under these conditions the curve obtained by them gives better results than the old I.C.I. curve. W. E. H.

45. Prediction of Illumination at a Point from a Source of Any Shape.
H. H. Higbie. Am. Illum. Eng. Soc. Trans., pp. 79-98, January 1, 1941.

The illumination at any point may be calculated by projecting the source upon the plane of the ceiling, and by dividing the resultant area into narrow strips. Charts are given from which the illumination at any point due to each strip may be found. J. S. G.

46. A Special Purpose Photometer.
Anon. El. Rev., Vol. CXXVII., No. 3,292, p. 345, February 7, 1941; Elec. Times, Vol. 99, No. 2,574, February 20, 1941.

Describes a direct-reading motor-car headlamp photometer similar to that which is to be issued to the police. R. G. H., W. E. H.

47. Low Intensity Illumination Gauge.
Anon. Electrical Times, Vol. 99, No. 2,571, January 30, 1941.

An illumination gauge to conform with the requirements of BS/ARP 30 is described. The comparison field is illuminated by the light emitted from a ring of radioactive luminescent material of known brightness. A colour filter is used to match the colour of the illumination under test with that emitted by the luminescent compound. W. E. H.

48. Photometer Head for Brightness Meter for Luminous Preparations.
L. F. Curtiss. Review of Scientific Instruments, Vol. 11, No. 12, December, 1940.

A new form of photometer head is described which enables the brightness of luminescent specimens less than 1 cm. in diameter to be determined with accuracy. Non-uniform illumination of the field is avoided by the use of a specially designed pattern mirror. The head is compact and does not require critical adjustment. W. E. H.

III.—SOURCES OF LIGHT.

49. Low Voltage Discharge Lamps.
"Megohm." Electrical Times, Vol. 99, No. 2,571. January 30, 1941.

The possibility of damage to tungsten lamps due to the voltage surge caused by switching off low voltage discharge lamps on the same circuit is discussed. Normally the condenser used in conjunction with the choke of a discharge lamp will absorb the inductive rise, but where condensers are used on groups of lamps instead of on each individual lamp, there is a risk of the capacity being under-estimated. W. E. H.

50. Alternating Current Circuits for Fluorescent Lamps.
R. F. Hays, D. S. Gustin. Am. Illum. Eng. Soc. Trans., pp. 939-948, December 10, 1940.

The effects of the inductive circuits necessary with fluorescent lamps upon the power factor of the circuit are discussed. A description is given of a two-lamp circuit with an overall power factor of nearly unity. J. S. G.

IV.—LIGHTING EQUIPMENT.

51. Prediction of Lighting Performance of Plastic Mould Designs by Experimental Models.
G. R. Baumgartner. Am. Illum. Eng. Soc. Trans., pp. 949-959, December 10, 1940.

The author describes a method of predicting the performance of pressed plastic lighting ware by means of paper models which reproduce closely the optical performance of the final design. J. S. G.

52. Rating Residence Luminaires.
W. F. Little. Am. Illum. Eng. Soc. Trans., pp. 981-1000, December 10, 1940.

A specification for domestic lighting fittings is described, and examples are given. J. S. G.

53. Cable and Flex Deterioration in Factory Fittings.
"Megohm." Electrical Times. Vol. 99, No. 2,574, February 20, 1941.

The importance of correctly designed pendant fittings to reduce cable trouble due to overheating is discussed, and stress is laid on the use of heat resisting flex. V.I.R. cable is, however, recommended for wiring tube pendants. W. E. H.

54. The Use of Radiant Energy for the Application of Heat.
H. Haynes. Am. Illum. Eng. Soc. Trans., pp. 61-78, January, 1941.

The author presents charts and tables of value in the design of radiant heating equipment for drying paint, evaporating moisture, and other applications. Test procedure is outlined, and methods of measurement are discussed. J. S. G.

55. Automatic Multiple Timer for Darkrooms.
Anon. "Electrical Times." Vol. 99, No. 2,572, February 6, 1941.

Describes a combined electrical development timer and safelight, which allows four films to be developed concurrently without the possibility of confusion. The processing times are automatically set and can be varied to compensate for deterioration of the developer or change of temperature. W. E. H.

V.—APPLICATIONS OF LIGHT.

56. Light and Architecture.
Anon. Am. Illum. Eng. Soc. Trans., pp. 879-884, December 10, 1940; pp. 11-16, January, 1941.

Some representative architectural lighting schemes are described with photographs. J. S. G.

57. Recommended Practice of Street Lighting, 1940.
Committee of the Illuminating Engineering Society. Am. Illum. Eng. Soc. Trans., pp. 17-48, January 1941.

The fundamentals of visibility in lighted streets are discussed, and recommendations for present practice are made. Suggestions are made for particular applications such as bridge and road tunnel lighting. J. S. G.

58. Sodium Lighting for a Chicago Viaduct.
O. H. Taylor. El. World, 114, p. 1953, December 28, 1940.

Details are given of the lighting of a 2,000-ft. viaduct in Chicago, using 10,000-lumen sodium vapour lamps. The four-lane roadway is 44 feet wide, and an average illumination in excess of 0.6 ft.c. is claimed, using a staggered system at 110 ft. spacing. S. S. B.

59. Sodium Lighting Permits Continuous Canal Traffic.
Robert B. Ely. El. World, 114, p. 1934, December 28, 1940.

At certain times of the year the Cape Cod Canal is particularly liable to mist and fog. To permit continuous use of the canal lights have been installed along its length (approx. 7¾ miles). Tests were made to determine the most suitable type of source, and sodium vapour lamps were finally adopted. Units are spaced 500 feet apart, and are wired so that alternate lamps only may be used in clearer weather. Two bridges over the canal are also lighted by sodium vapour lamps. Full details of the circuits are given. S. S. B.

60. Improved School Lighting.
H. B. Dates. Am. Illum. Eng. Soc. Trans., pp. 49-60, January 1, 1941.

The results of a survey of the lighting in American schools are given. J. S. G.

61. Operating Advantages of Controlled Conditions Plants.

W. J. Austin. Am. Illum. Eng. Soc. Trans., pp. 99-115, January 1, 1941.

It is stated that, in plants where only artificial light is used, ease of maintenance, simplification of plant layout, and allied advantages result in an increase in production and in an improvement of working conditions. J. S. G.

62. Modernising a Factory Lighting Installation.

Anon. Electrical Times, Vol. 99, No. 2,572, February 6, 1941.

The modernisation of the lighting of a tinfoil products factory has been carried out by the substitution of fluorescent electric discharge lamps for gas lamps. This has resulted in a fourfold increase in the illumination and the elimination of glare and hard shadows. W. E. H.

63. The Heating of Factory and Office Lighting Fittings.

H. G. Taylor, W. Lethersich, P. D. Morgan. Beama Journal, 48, pp. 11-15, January, 1941.

A detailed report on temperature measurements made by the B.E.A.I.R.A. on factory and office lighting units is given. C. A. M.

64. Milk Marketing Board.

Anon. Elect., 126, p. 115. February 21, 1941.

Some details, with photographs, are given of the new lighting equipment of the Milk Marketing Board. C. A. M.

65. Church Wiring.

Anon. El. Rev., Vol. CXXVIII., No. 3,292, p. 340, February 7, 1941.

New regulations for the installation of electric lighting of churches have been drawn up by the Central Council for the Care of Churches. Wiring regulations provide specially for features peculiar to the problem, both with a view to safety and to preserve appearances. R. G. H.

66. Fluorescent Lighting.

Anon. El. Rec., Vol. CXXVIII., No. 3,302, p. 439, March 7, 1941.

Full working details of the 80-watt. 5-foot tubular fluorescent "daylight" lamp are given. Reflectors are available for one, two, and three-lamp units. Illumination data and installation notes are given. R. G. H.

67. Fluorescent Lighting After Two Years.

Oscar P. Cleaver. Elect. Engineering, 59, p. 261. July, 1940.

The author reviews the performance of the tubular fluorescent lamp after a period of two years from its original introduction. Full technical details of the modern lamps are given, the economics of their use are discussed, and several applications described, with photographs. S. S. B.

68. Sensation of Warmth as Affected by Colour of Environment.

F. C. Houghton, H. T. Olson, J. Suciu. Am. Illum. Eng., Soc. Trans., pp. 908-914, December 10, 1940.

Tests upon subjects under controlled conditions of temperature and humidity indicate that no correlation between feeling and colour of surroundings exists within the comfort tolerance of the subjects. J. S. G.

YES A POWERFUL ROBUST SELF-SUSTAINING WINCH

Hundreds of thousands supplied during the last 35 years to Govt. Depts., Corporations, Railways, innumerable traders, etc., etc. Will not run back. No wheels to get caught in. *Direct Drive and Ratio Types*

WINCHES

Smallest wall space; side or front driving, also special types including multi-division barrels, combined horizontal and vertical operation, etc.

The London Electric Firm Croydon

Phone: Uplands 4871/2 (2 lines)

NO RATCHETS, PAWLS, SPRINGS, or GEAR WHEELS

69. Bactericidal Ultra-violet Radiation and its Uses.

H. C. Rentschler. Am. Illum. Eng. Soc. Trans., pp. 960-980, December 10, 1940.

Quantitative experiments on the bactericidal power of U.V. radiation are described, and the results are tabulated. Practical sources of radiation and their uses are discussed. J. S. G.

70. Neon Lighting and the Food Campaign.

Editorial. Elect., 126, p. 112, February 21, 1921.

A brief discussion is given on the present-day use of irradiation on fruit and vegetables. C. A. M.

71. Making of Spectacle Lenses.

Anon. The Glass Industry, Vol. 22, No. 1, January, 1941.

An illustrated account of the manufacture and inspection of spectacle lenses is given. Details of the testing of the raw materials are also included. W. E. H.

SITUATION DESIRED

Qualified Electrical Engineer (Diploma) seeks position in the Electrical Industry.

Age 39, Austrian, ex-Service man of the British Army, discharged on medical grounds.

Twelve years' experience in the lamp-making and affiliated industries in positions combining technical, commercial, and economical responsibilities. Fully experienced in British manufacture and business methods. Good references.

Write, Box 450, "Light and Lighting," 32, Victoria-street, London, S.W.1.

LINOLITE, LTD.—CHANGE OF ADDRESS

We are informed that the London office of Linolite, Ltd., is now situated at 1-5, Longmore-street, London, S.W.1. The address of the head office is as follows: The Mill Works, Malmesbury, Wilts.

REGD. TRADE MARK **NIPHAN**

CABLE COUPLINGS

WRITE FOR CATALOGUE 16C

Niphan Watertight cable couplings ensure a firm electrical contact in all capacities up to 600 amperes.

By using them you obtain flexibility in your circuits, and can enlarge, alter or dismantle any circuit whether for temporary or permanent lighting or power, with unskilled labour easily and quickly.

Special fittings can be designed to customers' specifications.

N573. THRO' ANGLE SOCKET

N558 ANGLE SOCKET

N547 PLUG

N547B PLUG

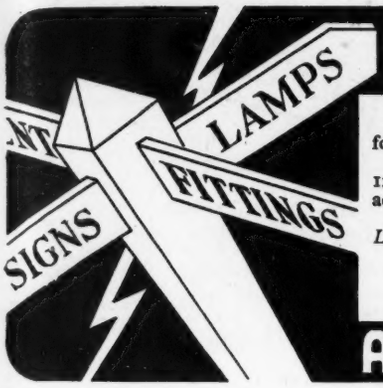
N549B FLANGE

N519 PUSH-ON PLUG
N515 FLANGE SOCKET

N557. TERMINAL SOCKET

N550 2-WAY TEE SOCKET

SIMMONDS & STOKES LTD.
Victoria House, Southampton Row, London, W.C.1. Holborn 8637 & 2163



WHERE TO BUY

We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3¼ inches wide) are given below.

These terms are equivalent to **half our ordinary advertising rates**, but not less than 12 successive monthly insertions can be accepted on this basis, and amounts are payable in advance.

Payment for an advertisement in this section entitles the advertiser to receive *Light and Lighting* during the period of the contract.

Terms:	12 Successive Monthly Insertions	£3 10 0	}	Payable
	24 " " "	£6 0 0		in
	36 " " "	£8 10 0	}	Advance

A DIRECTORY OF LIGHTING EQUIPMENT

1

PHOTOMETER BENCHES Cubes, Spheres, Heads, Standards of Light, Special Accessories

Makers to principal research and technical bodies, lamp manufacturers and educational establishments.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER, S.W.1

2

ALLOM BROTHERS LTD.
LOMBARD ROAD, MORDEN ROAD, S.W.19.
Lighting Specialists
Decorative Fittings. Industrial Fittings
Sheet Metal Work.

3

Take no risks— specify **BENJAMIN PLANNED LIGHTING**
THE BENJAMIN ELECTRIC, Ltd., TARIFF ROAD, N.17

4

LIGHT-CONDITION your industrial plant with the following BTH Equipment :—
MAZDA or MERCRA or SODRA Lamps in MAZDALUX Reflectors.
The free advisory services of BTH Lighting Engineers are at your command
THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, ALDWYCH, W.C.2.

5

THE REINFORCED CONCRETE LAMP COLUMN SPECIALISTS
CONCRETE UTILITIES, Ltd., WARE, Herts.
Enquire for details of "Aids to Movement" in concrete.

6

DRAKE & GORHAM LTD.
36, GROSVENOR GARDENS, LONDON, S.W.1
and Branches - - - - - - - - -
Specialists in Factory Lighting and in all problems Relating to the Requirements of the New Factory Act

7

"ESLA"
BI-MULTI AND MULTIPLANE REFLECTORS
Lanterns, Brackets, Columns, Switches and Fuse Boxes, etc., FOR STREET LIGHTING
The Electric Street Lighting Apparatus Co., The Foundry, Canterbury.

8

VITREOUS ENAMELLING
(CAST and SHEET IRON)
Spun Reflectors, Lamp Casings, Sheet-metal Work, etc.
ELM WORKS LTD. SUMMERSTOWN, LONDON S.W.17. Est. 1903

9

ENGINEERING & LIGHTING EQUIPMENT CO. LTD.
SPHERE WORKS, ST. ALBANS, HERTS.
TELE. 258
DISCHARGE LIGHTING
FITTINGS FOR ALL PURPOSES

10

EEL REGISTERED
THE SELENIUM PHOTO-CELL
ARTHUR E. EVANS & CO., LTD. BISHOP'S STORTFORD, HERTS

11

PHOTOMETERS
PHOTO-ELECTRIC
BENCH, CUBE, STREET and PORTABLE TYPES
FOR CANDLE-POWER AND ILLUMINATION TESTS
EVERETT EDGCUMBE Colindale Works LONDON, N.W.9

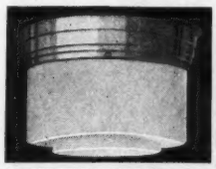
12

THE GUNFIRE (Trade Mark)
PIONEERS of AUTOMATIC LIGHTING
GAS CONTROLLERS, ELECTRIC, and SYNCHRONOUS TIME SWITCHES
Manufactured by :—
BRITISH, FOREIGN AND COLONIAL AUTOMATIC LIGHT CONTROLLING CO., LTD., BOURNEMOUTH

13

Aldwych House, London, W.C. **G·V·D** *Telephone : Holborn, 7277-8*
FOR BETTER LIGHTING

14



Decorative, Architectural and Commercial Lighting Fittings and Equipment.
Harcourts LIMITED
Stanhope Hse, 1 Kean St., Aldwych, London, W.C.2.
Telephone : Temple Bar 9671/2/3/4 H.L.50

15

SCIENTIFIC Holophane ILLUMINATION

The Hall-Mark of Good Lighting

16

NEWBRIDGE

After the war we hope to serve public lighting engineers by producing even better NEWBRIDGE gas controllers and Comets and H.B.E. electric time switches than in the past

'Grams: Horstmann, Bath THE HORSTMANN GEAR CO., LTD., NEWBRIDGE WORKS, BATH, SOMERSET 'Phone: 7241/2.

17

C. H. KEMPTON & Co. LTD., FOR MODERN STREET LIGHTING BY GAS

70-72, BENNERLEY ROAD, S.W.11

18

LIGHT and LIGHTING by LINOLITE

19

MEK-ELEK Engineering Ltd., 17, Western Road Mitcham, Surrey MITcham 3072. Cables: Mekelek, London

20

F. H. PRIDE LTD.

ILLUMINATING ENGINEERS

CINEMA & HOTEL LIGHTING SPECIALISTS

Designers and Manufacturers of Modern Lighting Fitments and Electrical apparatus

69-81, CLAPHAM HIGH ST., S.W.4 Telephone: MACaulay 2281/4.

21

LIGHT RAY APPARATUS

Control of Street, Factory and Sign Lighting. Smoke Indicator and Recorder. Automatic Fuel Feed Control.

RADIOVISOR PARENT LIMITED, "Darnoc House," 36, Alfred Place, London, W.C.1. 'Phone: Museum 2888/9

22

REGD. TRADE MARK NIPHAN

PLUGS, SOCKETS, TEES, COUPLINGS, TERMINAL-SOCKETS AND JOINT BOXES

for every portable and temporary lighting requirement

SIMMONDS & STOKES LTD.

VICTORIA HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1

Phones: (Head Office) Holborn 8637, (Works) Putney 1364

23

ELECTRIC LAMPS *of all types* "SIERAY" ELECTRIC DISCHARGE LAMPS ELECTRIC LIGHT FITTINGS

SIEMENS

STORE & INDUSTRIAL LIGHTING EQUIPMENT

CINEMA LIGHTING, etc.

38-39, UPPER THAMES STREET, LONDON, E.C.4

24

WASK

PATENT SELF SUSTAINING WINCHES FOR ALL PURPOSES

Quick hoisting with little effort MADE IN TWO SIZES

Walter Slingsby & Co. Ltd., Keighley

Tel.: Keighley 3749 (2 lines)

25

SPECIAL REFLECTORS DESIGNED FOR THE NEW FLUORESCENT LAMP WITH A SUITABLE TYPE FOR SHOWCASES.

STRAIGHT-LITE REFLECTORS, LTD., 73, CANONBURY ROAD, LONDON, N.1.

Telephone: CANonbury 2066 (two lines)

26

STRAND ELECTRIC AND ENGINEERING Co.LTD.

SPECIALISTS IN COLOUR LIGHTING and STAGE EQUIPMENT

LIGHTING FOR EVERY OCCASION

THEATRES·EXHIBITIONS FLOODLIGHTING·CINEMAS BALLROOMS·PAGEANTS

19-24 FLORAL ST. LONDON, W.C.2

27

For every type of GAS LIGHTING

SUGG WESTMINSTER

When you want the best! CHAPTER ST., S.W.1

28

"THORLUX"

"OVERLAMP" REFLECTORS.

DISCHARGE or GASFILLED LAMPS

SLIP-IT-ON—SLIP-IT-OFF-OVER THE LAMP FOR CLEANING

F.W.THORPE LTD. WELBY ROAD HALL GREEN BIRMINGHAM.28.

FOR EASY MAINTENANCE THE BEST

29

WARDLE ENGINEERING Co., Ltd.

OLD TRAFFORD, MANCHESTER, 16.

PRISMALUX DIRECTIONAL LIGHTING UNITS

for stairways, corridors and doorways

Also for A.R.P. Shelters and tunnels.

INDEX TO "WHERE TO BUY"

Accessories	22
Architectural Lighting	6, 13, 14, 18, 25, 26
Automatic Light Control	12, 16, 21
Cinema Lighting	6, 14, 15, 20, 23, 26
Concrete Pillars, etc.	5
Electric Lamps	4, 23
Fittings	2, 3, 4, 7, 8, 9, 13, 14, 15, 17, 18, 19, 20, 23, 25, 26, 27, 28, 29
Floodlighting	2, 4, 9, 15, 23, 26
Gaslighting	17, 27
Glassware	15
Industrial Lighting	3, 4, 6, 8, 9, 13, 14, 19, 23, 29
Local Lighting	19
Photo Electric Cells	10, 21
Photometers	1, 11
Reflectors	3, 4, 7, 8, 9, 15, 23, 25, 28
Signal Lights	29
Special Lighting	2, 6, 9, 12, 14, 15, 18, 20, 23, 25
Street Lighting Units	4, 7, 8, 9, 15, 17, 23, 27
Theatre Lighting	2, 14, 23, 26
Time Switches	12, 16
Winches and Suspension Gear	24

N.B.—The numbers are those attached to individual entries in the Directory

(See pp. 51—52)

1941

TRIAL
T
A
etc.
C.4

E
A
,,

IC
IONS
EMAS
ANTS
.W.C2

you
t
est!
ST.,

d.
rs

22
25, 26
16; 21
23, 26
5
4, 23
28, 29
23, 26
17, 27
15
23, 29
19
10, 21
1, 11
25, 28
29
23, 25
23, 27
23, 26
12, 16
24

Directory